M/019/005

PCS Potash MOAB

MOAB SALT, INC.
P.O. Box 1208, Moab, Utah 84532 • Office 801-259-7171 • FAX 801-259-7100

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DIV. OF OIL, GAS & MINING

FAX MEMO

To: TONY GALLEGOS

DOUG JENSEN

From: Rick York
General Manager
PCS Potash - Moab Division

Number of Pages (including cover page): 24

Message:

FOLLOWING INCLUDE ESTIMATES FOR WELL & SHAFT PLUGGING, QUOTATION FOR DEMOLITION OF CRYSTALLIZER BUILDING, AND MARKED UP SHEETS OF RECLAMATION ESTIMATES

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MOAB SALT, INC.

MOAB, UTAH

CANE CREEK MINE

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PLAN FOR

ABANDONMENT

OF CLASS III WELLS

AND MINE SHAFTS

Revision 3

Description of Wells

Twenty-four wells have been drilled by Texasgulf/Moab Salt since operations began in 1962. These wells vary in depth from 2,648 to 4,133 feet. Casing size ranges from 4.5 to 20 inches. The are two main purposes for these wells. The first is to provide access to the old mine workings for the purpose of extracting ore by solution mining. The second was a test program to evaluate mining outside the old mine workings.

Wells #2 through #16 were drilled from 1970 to 1975 for the purpose of solution in the old mine workings. These wells are located in faulted areas and have had problems with loss of mechanical integrity.

Wells #2, #8, #13, and #14 were used for injection, but developed leaks. Well #2 was plugged in 1975, and Wells #8, #13 and #14 were plugged in 1988.

Wells #3 and #9 were drilled for injection, but missed the mine. Well #3 was used for six months in 1974 in the test well program. It was plugged in 1989. Well #9 was never used and was also plugged in 1989.

Wells #7 and #11 were drilled for injection and did enter the mine, but encountered problems and were temporarily plugged. Well #7 was initially plugged in 1971, and the plugging and abandonment was completed in 1988. Well #11 had a bridge plug and some cement set in place in 1971. The plugging was completed in 1989.

Wells #4 and #10 were used for injection, but developed problems. These wells were plugged in 1988.

Wells #12, #16 and #20 failed a mechanical integrity test early in 1989 and were plugged the same year.

Well #1 was drilled in 1970, but did not enter the mine. It was also used in the test well program, and was plugged in 1989.

Wells #17, #18, #19, #21, #22 and #23 were also outside the mine and used in the test well program. Well #19 was plugged in 1988 and Wells #21, #22 and #23 were plugged in 1989. Wells #17 and #18 were plugged in 1993.

Well #24 was drilled in 1994 and is used for injection. Well #6 is used for extraction.

Well #15 was used for injection and plugged in 1995. Well #5 was used for injection and was plugged in 1996. Both of these wells failed Mechanical Integrity Tests before being plugged.

PROCEDURE FOR ABANDONMENT OF WELLS

The following plan has been updated from the original submittal to incorporate guidance from the BWPC that was forwarded to Moab Salt on March 29, 1989.

The first step in abandoning a well will be an evaluation of the cement outside the casing. This will be done using a cement bond log (or other approved methods). A bridge plug will then be placed at the bottom of Salt 2. A workover rig will then run drill pipe into the well to a point just above the plug. A cement plug 400 feet in length will be pumped in. If the cement bond log shows inadequate cement behind the casing, the casing will be perforated just above the plug prior to placing the cement. The cement will then be placed under pressure or "squeezed" in order to seal the formation outside the casing. The placement of the cement plugs shall be in accordance with 40 CFR 146.10(b). The cement shall be salt-saturated API Class B cement, with a density of 120 lb/ft^3. Cementing will continue until a continuous 100-foot zone outside the casing is established. The adequacy of this zone will be verified before proceeding to the intermediate plug.

The intermediate plug of bentonite shall be placed in accordance with 40 CFR 146.10(c). The minimum density shall be 64.57 lb/ft^3. A state of static equilibrium shall be achieved before placement of a surface plug.

The surface plug shall consist of a minimum of 200 feet of salt-saturated API Class B cement with a density of 120 lb/ft^3. It will also be placed in accordance with 40 CFR 146.10(b).

EKY/mp
9/30/92

ABANDONMENT PLAN

DETAILS OF EACH WELL AND MATERIALS REQUIRED

Well #	Surface Elevation	Pipe Size	Wall Thickness	Inside Area	Top Depth	Bottom Depth	Plug Location	Ft³ Bentonite	Ft³ Cement
6	4037	20.00	0.635	1.913	0	1040			
		16.00	0.625	1.187	937	3198	2700	3028	857
24	4283	9.625	0.352	0.434	0	3085	2500	825	260

Note: The tabulations above and the calculations below show only the amount of material required to fill the casings

Well #6 Cement: 200 lin. ft. x 1.913 ft³/lin. ft. + 400 lin. ft. 1.187 ft³/lin. ft. = 857 ft³
Bentonite: 737 lin. ft. x 1.913 ft³/lin. ft. + 1363 lin. ft. 1.187 ft³/lin. ft. = 3028 ft³

Well #24 Cement: 600 lin. ft. x 0.434 ft³/lin. ft.. = 260 ft³
Bentonite: 1900 lin. ft. x 0.434 ft³/lin. ft.. = 825 ft³

COSTS FOR EACH WELL

Well #	Logging and Plug Cost	Rig Cost	Cement Cost	Bentonite Cost	Pumping Cost	Cement Crew Cost	Total Cost Per Well
6	$13,500	$8,000	$25,000	$2,000	$3,500	$2,000	$54,000
24	$10,000	$8,000	$7,000	$500	$3,500	$2,000	$31,000
						Total	$85,000

Note: Cement cost reflect the amount necessary to fill 250% of the volume of the casing at the lower plug.

NO. 1 SHAFT PLUGGING PROCEDURE

When this operation switched to solution mining in 1972, there was no longer any need to access the mine workings via the No. 1 shaft. This shaft was filled with salt by pumping the tailings salt from the mill into the shaft. This took approximately two weeks.

The plugging and abandonment plan calls for removing the salt in the shaft down to a depth of 2000 feet. This will be done by drilling holes down both the east and west sides of the shaft. Six-inch pipes will be inserted in each hole down to 2000 feet. River water will then be pumped down the pipes to dissolve the salt and result in a brine at the surface. The brine and solids from the shaft will be pumped to the tailings lake. When all of the salt above 2000 feet is extracted, the two six-inch pipes will be removed.

The next step requires a 100-foot thick plug of cement placed between elevations 1900 feet and 2000 feet on top of the remaining salt. The cement shall be salt-saturated API Class B cement with a density of 120 lb/ft^3 in accordance with 40 CFR 146.10(b).

The next step is the placing of gravel in the shaft from the 1900-foot elevation up to the existing cement cap which extends down 12 feet (see Appendix H). The access to the shaft will remain accessible for five years so gravel can be added to it as settles over time.

EKY/mp
12/4/92

ABANDONMENT PLAN

Cost Estimate to Plug #1 Shaft

	HRS	$/HR	
Prepare Shaft for Solution Mining			
Prepare Headframe as Derrick			$10,000.00
Move in Workover Rig	8	$185.00	1,480.00
Pickup Pipe	2	$185.00	370.00
Rent 2000 ft 2-7/8" Drill Pipe @ $.06/ft/day 2 Days			240.00
Drill to 2000 ft @5 ft/min West Side	8	$185.00	1,480.00
Drill to 2000 ft @5 ft/min East Side	8	$185.00	1,480.00
Lay Down Drill Pipe	2	$185.00	370.00
Rental on 6" Pipe @$.07/ft/day for 40 Days			11,200.00
Pickup 6" Pipe	2	$185.00	370.00
Set 6" Pipe to 2000 ft East Side	6	$185.00	1,110.00
Pickup 6" Pipe	2	$185.00	370.00
Set 6" Pipe to 2000 ft West Side	6	$185.00	1,110.00
Travel Costs Casing Crew			400.00
Casing Crew 2 Days at $1950/day			3,900.00
Valves and Fittings for Surface			10,000.00
Install Valves and Fittings			4,000.00
	Subtotal		$47,880.00
Solution Mine Salt from #1 Shaft			
Prepare Area by River for Pumps			$ 1,000.00
Setup 50-HP 1500-GPM Diesel Pump at River			500.00
Setup 2 - 200-HP 1500-GPM Diesel Pumps at River			2,000.00
Rental on 50-HP Pump for 30 days at $50/day			1,500.00
Rental on 200-HP Pups for 30 Days at $100/Day/Ea			6,000.00
Install 2800 ft 8" Pipeline from River to Shaft			4,200.00
Rental on Pipe for 30 Days @ $.13/ft/day			10,920.00
Setup 50-HP 1500-GPM Pump at Shaft			500.00
Rental on 50-HP Pump for 30 Days @ $50/Day			1,500.00
Install 900 ft 8" Pipe from Shaft to Tails lake			1,350.00
Rental on 900 ft 8" Pipe			3,510.00
Fuel for Pumps			
2 - 200-HP 11 gal/hr*24 hrs*30 days*$1.00			15,840.00
2 - 50-HP 4 gal/hr*24 hrs*30 days*$1.00			5,760.00
Operator 30 Days @ $30/hr			21,600.00
	Subtotal		$75,180.00
Remove 6" Pipe from Shaft			
Move in Workover Rig	8	$185.00	$ 1,480.00
Remove 4000 ft 6: Pipe	12	$185.00	2,220.00
Lay Down 6" Pipe	4	$185.00	1,110.00
Travel Costs Casing Crew			400.00
Casing Crew 2 Days @ $1950/Day			3,900.00
	Subtotal		$ 9,110.00
Total for Removing Salt			$132,170.00

ABANDONMENT PLAN

Cost Estimate to Plug #1 Shaft

Cost of Cement for Shafts			
Cost per 94-lb Sack		$4.50/sack	
Halliburton Handling Charge $5.50		1.00/sack	
Cementing Costs - 32,215 Sacks Required			
Assuming 6 Days, 5400 Sacks per Day			
Move in Workover Rig			$ 1,110.00
Move in Cost for Halliburton			
Cement Pump Truck	215 Miles @ $2.60	$ 559.00	
Bulk Truck	215 Miles @ $2.60	559.00	
Crew Truck	215 Miles @ $1.35	290.25	
Subsistence 3 Men @ $100 - 6 Days		1,800.00	
			3,208.00
Workover Rig 6 - 8 Hr. Days @ $185/hr.			8,880.00
Rent 2000 ft 2-7/8" Drill Pipe @ $.06/ft/Day 6 Days			720.00
Halliburton Cement Truck 6 Days @ $1,260			7,560.00
Halliburton Subsistence 3 Men 6 Days @ $100/day			1,800.00
1000 Sack Cement Bins 6 Required			
Move in Cost 215 Miles @ $1.00		$1,290.00	
6 Bins @ $100/Day * 6 Days		3,600.00	
			4,890.00
Total Pumping Costs			$ 28,168.00
Cement Cost #1 Shaft 32,215 Sacks			177,182.00
Total Cementing Costs			$205,350.00
Prepare Shaft for Filling with Gravel			
Drill and Blast 4 ft. Dia. Hole in Center of Shaft			$ 4,000.00
Fabricate 3 ft. Thick Removable Cover with 6" Inspection Pipe			3,000.00
Fabricate Chute for Dumping Gravel in Shaft			3,000.00
		Subtotal	$ 10,000.00
Fill #1 Shaft with Gravel (1900 ft. Deep 22-ft. Diameter)			
(See Appendix H for Availability and Cost of Gravel)			
Fill with 26750 cu. yds. Gravel @ $4.50/CY			$120,375.00
Refill with Gravel after Five Years			
Gravel Refill			
Assume 10% Settling (2675 cu. yds.) @ $4.50/CY			$ 12,037.00
Total Cost for Gravel Fill			$142,412.00
TOTAL COST TO PLUG #1 SHAFT			$479,932.00

NO. 2 SHAFT PLUGGING PROCEDURE

The No. 2 shaft was originally drilled into the mine as a ventilation shaft. Since the start of solution mining, this shaft has been used to measure the level of the brine in the mine.

The plugging and abandonment plan calls for placing approximately 50 feet of gravel in the shaft, filling it to an elevation of 2650 feet. A 100-foot thick concrete plug will then be installed. The cement shall be salt-saturated API Class B cement with a density of 120 lb/ft^3 in accordance with 40 CFR 146.10(b).

The next step is filling the balance of the shaft with gravel. The shaft will be capped with 3 feet of concrete. A 6-inch inspection hole through the cap will allow gravel to be added as gravel in the shaft settles over a five-year period.

EKY/mp
12/15/97

ABANDONMENT PLAN

Cost Estimate to Plug #2 Shaft

Cementing Costs			
Assuming 1 Day, 5400 Sacks per Day			
Move in Workover Rig			$ 1,110.00
Move in Cost for Halliburton			
Cement Pump Truck 215 Miles @ $2.60	$ 559.00		
Bulk Truck 215 Miles @ $2.60	559.00		
Crew Truck 215 Miles @ $1.35	290.25		
Subsistence 3 Men @ $100 - 1 Day	300.00		
		1,708.00	
Workover Rig 1 - 8 Hr. Days @ $185/hr.		1,480.00	
Rent 2650 ft 2-7/8" Drill Pipe @ $.06/ft/Day 1 Day		159.00	
Halliburton Cement Truck 1 Day @ $1,260		1,260.00	
Rig Crew Subsistence 3 Men 1 Day @ $100/day		300.00	
1000 Sack Cement Bins 1 Required			
Move in Cost 215 Miles @ $1.00	$ 215.00		
1 Bin @ $100/Day * 5 Days (Min)	500.00		
		715.00	
Total Pumping Costs			$ 6,732.00
Cement Cost #2 Shaft 1,065 Sacks			$ 5,858.00
Total Cementing Costs			$ 12,590.00
Prepare Shaft for Filling with Gravel			
Remove Steel Cap			$ 500.00
Fabricate 3 ft. Thick Removable Cover with 6" Inspection Pipe			1,500.00
Use Chute from #1 Shaft for Dumping Gravel			
Subtotal			$ 2,000.00
Fill #2 Shaft with Gravel (2250 ft. Deep 4-ft Diameter) (See Appendix H for Availability and Cost of Gravel)			
Fill with 1187 cu. yds. Gravel @ $4.50/CY			$ 5,342.00
Refill with Gravel After Five Years			
Gravel Refill			
Assume 10% Settling (119 cu. yds.) @ $4.50/CY			535.00
Total Cost for Gravel Fill			$ 7,877.00
TOTAL COST TO PLUG #2 SHAFT			$ 20,467.00

ABANDONMENT PLAN
TOTAL COST ESTIMATE

1.	Plug Wells #6 and #24	$85,000
2.	Plug #1 Shaft	$480,000
3.	Plug #2 Shaft	$20,500
4.	Engineering Supervision @ $500/day - 50 days	$25,000
	Subtotal	$610,500
	15% Contingency	$91,500
	Total	$702,000
Adjusted to 2002 @ 3.00% Interest (rounded to 000)		$814,000